NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

REPLY TO
ATTN OF:

October 16, 1970

TO: USI/Scientific & Technical Information Division
Attention: Miss Winnie M. Morgan

FROM: GP/Office of Assistant General
Counsel for Patent Matters

SUBJECT: Announcement of NASA-Owned
U.S. Patents in STAR

In accordance with the procedures contained in the Code GP to Code USI memorandum on this subject, dated June 8, 1970, the attached NASA-owned U.S. patent is being forwarded for abstracting and announcement in NASA STAR.

The following information is provided:

U.S. Patent No. : 3,318,343

Corporate Source : International Business Machines

Supplementary
Corporate Source : Federal Systems Division

NASA Patent Case No.: XMF-02107

Please note that this patent covers an invention made by an employee of a NASA contractor. Pursuant to Section 305(a) of the National Aeronautics and Space Act, the name of the Administrator of NASA appears on the first page of the patent; however, the name of the actual inventor (author) appears at the heading of Column No. 1 of the Specification, following the words ". . . with respect to an invention of. . . ."

Gayle Parker

Enclosure:
Copy of Patent

N71-10809

May 9, 1967 HUGH L. DRYDEN, DEPUTY ADMINISTRATOR OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION 3,318,343

TOOL ATTACHMENT FOR SPREADING LOOSE ELEMENTS AWAY FROM WORK

Filed July 23, 1964 3 Sheets-Sheet 1

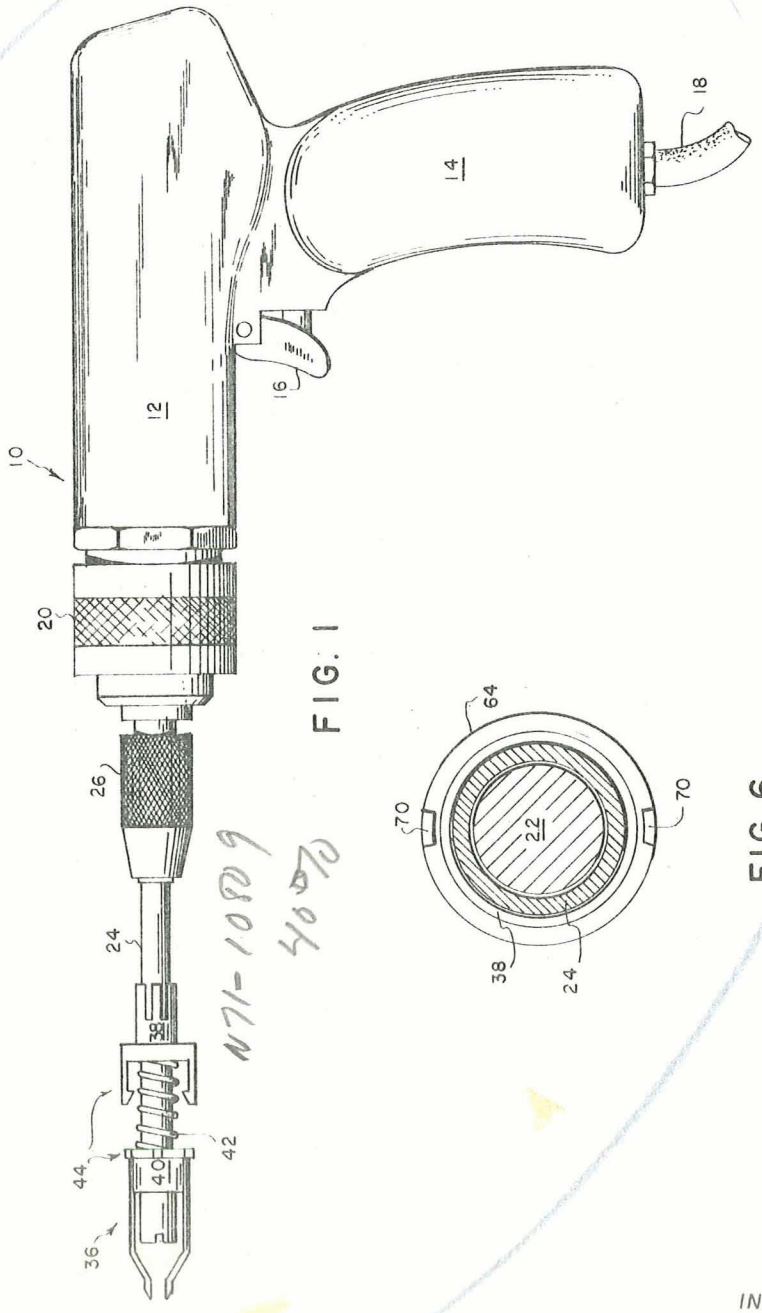

FIG. 1

FIG. 6

N71-10809

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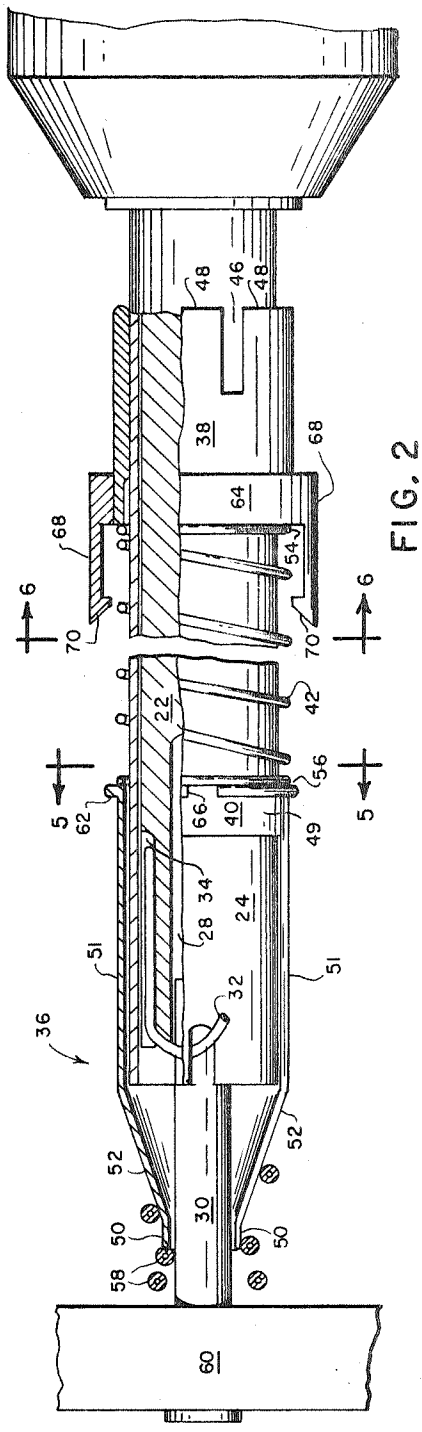

FIG. 2

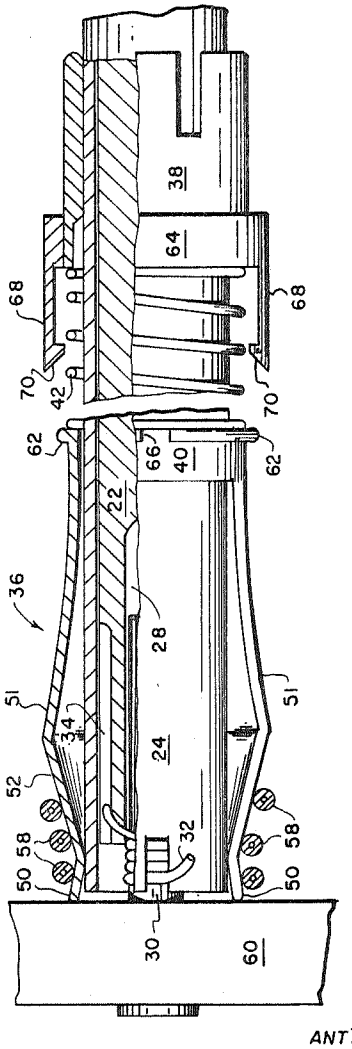

FIG. 3

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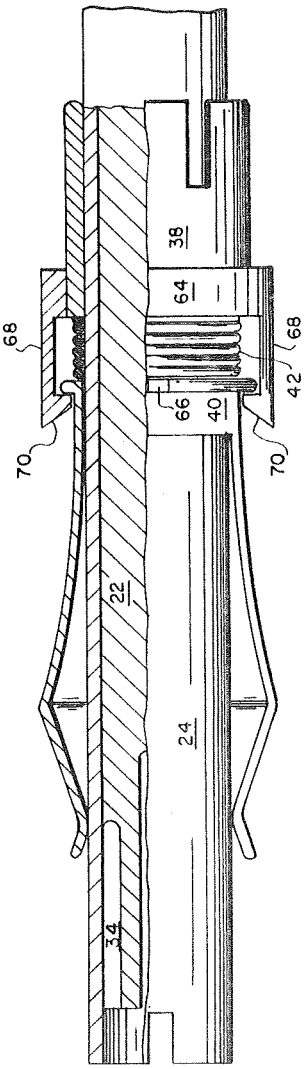

FIG. 4

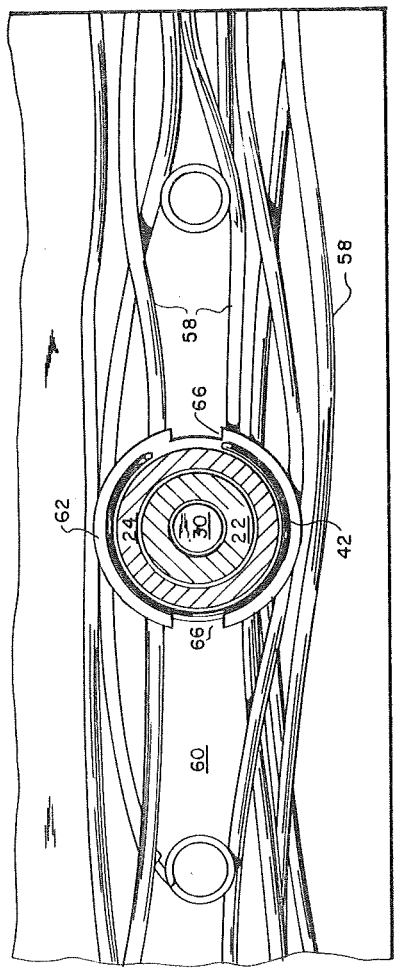

FIG. 5

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United States Patent Office

3,318,343
Patented May 9, 1967

3,318,343

TOOL ATTACHMENT FOR SPREADING LOOSE ELEMENTS AWAY FROM WORK

Hugh L. Dryden, Deputy Administrator of the National Aeronautics and Space Administration with respect to an invention of Anthony J. Charnosky, Wilkes-Barre, Pa.

Filed July 23, 1964, Ser. No. 384,811
9 Claims. (Cl. 140—124)

ABSTRACT OF THE DISCLOSURE

The present invention relates to a tool attachment for spreading or moving away loose elements, e.g. wires, located adjacent a post. The attachment is shown in conjunction with a conventional mechanical connecting tool used for wrapping electrical conductors around a post. The tool attachment has a clamping means for securing it to the tool's shaft and a lower annular sleeve with projecting fingers which is adapted to slide over the post. The fingers will push away loose elements about the post as they slide down over the post. Also, the fingers will spread outwardly from the post after contact with the base surface supporting the post so as to move the loose elements further from the post.

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958, Public Law 85–568 (72 Stat. 435; 42 U.S.C. 2457).

The present invention relates generally the effecting of a connection between a filamentary element and a binding post, and more particularly to a spreading or parting device for facilitating the formation of such a connection on a binding post that is partially surrounded by loose elements by spreading these elements away from the post so that a rotary tool can be employed to wind the filamentary element in successive convolutions about the post and in intimate engagement therewith.

As is well known, the construction of practically all wired electrical circuits and especially those extremely large, high density circuit boards of the type presently employed in large launch vehicles and their supporting equipment, requires that enumerable filamentary elements be connected between various terminal or binding posts. To effect as permanent and shock resistant a connection as possible on these boards it is often necessary that these elements, which are usually electrical conductors, be wrapped around the posts after which solder is generally applied for bonding purposes. Since this wrapping step, if done by hand, is difficult, expensive and often unreliable due to human error, it has been found desirable to use a mechanical wrapping or connecting tool whenever possible.

Wrapping or connecting tools of the type generally employed in forming such a wrapped binding post conventionally include a shaft or bit which may be journaled for rotation in a stationary guide or sleeve. The bit is provided adjacent its forward end with a longitudinal recess for the reception of the binding post or terminal and a radially offset longitudinal disposed groove for the reception of the conductor so that it is wound about the post upon rotation of the bit. For an example of such a tool reference is made to United States Patent No. 2,758,797, issued August 14, 1956 to Western Electric, Inc., as assignee of E. P. Miklau.

Even though such wire wrapping or connecting tools are as a general rule very efficient and quite easy to use

there are certain instances where they cannot readily be utilized for wrapping a filamentary element about a binding post. One such instance is where the binding post to be wrapped is partially or completely surrounded and hidden by loose filamentary elements or other like components. Where all or part of the binding post is thus hidden it is necessary that steps be taken to move or spread the elements away from the terminal before the shaft and stationary guide of the wrapping tool can be forced down far enough over the post to make a suitable wrap. This is especially true where the wrap is to be made near the base of the binding post. Heretofore such a spreading of various loose elements away from a binding post to be wrapped has required a manual step consisting of carefully spreading or pushing the elements away from the post with a probe like instrument which closely resembles an "ice pick." This manual step and the use of such an instrument is both time consuming, tedious and often results in the various filamentary elements located around the terminal being damaged by the pointed probe.

According to the present invention it has been found that an adapter, which can be readily attached to or removed from a conventional connecting tool, can be used for spreading or moving away any loose elements located around a binding post as a filamentary element is being simultaneously wrapped therearound. This adapter consists of a spreading head which is attached through a spring to a locking element that is used to secure the adapter over the stationary guide of the connecting tool. As the tool is forced down around the terminal the spreading head slides down over the binding posts and thus between the post and any loose elements located therearound until it engages against the base of the post. At this point the connecting tool is forced down against the base of the post thereby forcing the spreading head up against the spring and the shaft of the tool through the head thus forcing it apart. This opening or forcing apart of the head acts to spread or move the loose elements away from the binding post thereby leaving it exposed for wrapping with a filamentary element.

Therefore, a primary object of this invention is to provide a tool which will move or press back any loose elements resting on or near a binding post thus leaving the post fully exposed.

Another object of this invention is to provide a spreading tool which is adapted to move longitudinally along a binding post for moving any loose elements located adjacent to or lying against the post away therefrom thus leaving the post fully exposed along its complete length.

Yet another object of this invention is to provide an element spreading device that is readily attached to a tool and can be carried or placed in an inoperative condition on the tool whenever its use is not required.

Yet still another object of this invention is to provide an element spreading adapter for use in conjunction with a conventional wire connecting tool.

A further object of this invention is to provide an element spreading adapter that is readily attached to or removed from presently existing or conventional wire connecting tools without any modification or change being required in the tools themselves.

These and other objects and advantages of this invention will become more apparent upon reference to the accompanying specification, claims and appended drawings wherein:

FIGURE 1 is a side elevation of an element spreading adapter constructed in accordance with the present invention as it appears attached on a conventional filamentary connecting tool;

FIGURE 2 is an enlarged fragmentary end elevation

partially in section of the element spreading adapter and connecting tool shown in FIGURE 1 placed in position for securing a filamentary element over a binding post that is surrounded by loose components;

FIGURE 3 is a view similar to FIGURE 2 with the wire connecting tool pressed down against the base of the binding post and the jaws of the spreading adapter biased apart for holding the loose filamentary elements away from the post during the connecting or wrapping operation;

FIGURE 4 is a side elevation illustrating the method by which the spreading adapter is secured in an inoperative or stored position on the wire connecting tool when it is not in use;

FIGURE 5 is a cross-sectional view taken along line 5—5 of FIGURE 2 showing the catch ring of the spreading adapter; and

FIGURE 6 is a cross-sectional view taken along line 6—6 of FIGURE 2 showing the locking fingers of the spreading adapter.

In order to better understand the construction and operation of this invention it will be described in reference to its use with a conventional wire connecting or wrapping tool for which it was specifically designed. It is to be realized, however, that this novel element spreading adapter will give superior results which used with other tools. For example, the spreading adapter could be placed over a moving shank such as found on a bit or screw-driver. Such a use permits the loose elements covering a surface upon which work is to be performed to be spread away therefrom.

With continued reference to the accompanying drawings wherein similar parts throughout the various are designated by like numerals, and with initial attention directed to FIGURE 1, a conventional wire connecting or wrapping tool for effecting a connection of a wire with a binding post is designated generally at **10**. In general this tool, which is shown for purposes of illustration, includes a body **12** which is equipped with a pistol grip handle **14** mounting a finger piece **16** by means of which the power supply to the tool is controlled. The illustrative tool **10** is of the type adapted for pressure fluid actuation and it incorporates within the body **12** a rotor fluid motor (not shown) to which pressure fluid is supplied by way of a suitable hose or fitting **18** connected to the tool at the base of the handle **14**. In the illustrative tool, the finger piece **16** is operably associated with valve means (not shown) disposed within the handle **14** for controlling the admission of pressure fluid to the motor that is deposited within the body **12**. Obviously, an electric motor and power supply could be substituted for the fluid units described if such were necessary or desirable.

At its forward end the tool **10** terminates in a nose assembly, generally designated **20**, which may incorporate suitable speed reduction gearing and a clutch mechanism for coupling the tools motor to a wire winding bit or tool head **22** (see FIGURE 2). The bit **22** as shown is journaled within a stationary shank or sleeve **24** which is adapted to be mounted on the nose assembly **20** by means of a clamping nut or chuck assembly **26**.

As shown in FIGURE 2 the bit **22**, which is journaled in the stationary sleeve **24**, is provided with a longitudinal recess **28** for the reception of a binding post or terminal **30** about which a filamentary element such as wire **32** is to be wound. In the case where an electrical circuit is being fabricated, as is usually the case, this winding of the bare wire upon the terminal would serve to effect an electrical connection therebetween. The recess **28** is of a diameter greater than the maximum transverse dimension of the terminal **30** to permit free rotation of the bit **22** with respect to the terminal so as not to twist the terminal. A wire receiving groove **34** is formed axially along the outer surface of the bit **22** for receiving and holding the end of the wire **32** during the wire wrapping operation.

As illustrated in FIGURE 1, a spreading adapter, generally designated at **36**, is attached over the stationary sleeve or guide **24**. As will be noted, this spreading adapter can be broken down into four main elements. Namely: (1) A clamping attachment **38**; (2) a head **40**; (3) a biasing or spring element **42**; and (4) a locking element generally designated at **44**.

As more clearly shown in FIGURES 2–4, the clamping attachment **38** preferably takes the form of a sleeve into one end of which has been cut longitudinal notches **46**. These notches **46** effectively form a plurality of fingers **48** which are pre-set in a condition so that they tightly grip any shaft of a predetermined diameter over which the sleeve is slipped. In the present instance the fingers **48** are shown engaging the outer surface of the guide **24** of the connecting tool **10**. Obviously, numerous other type clamps could be used for holding the spreading adapter **36** and its associated components in operating position on the guide **24** of a wire wrapping tool. In fact, the spreading adapter could be fabricated as a part of the stationary guide if such were desirable. However this detachable type clamp is preferred since it is inexpensive to produce and permits the adapter to be rapidly attached to, adjusted along, and removed from the guide.

The head **40** of the spreading adapter **36** consists in part of an annular sleeve **49** which has an inside diameter slightly greater than the outside diameter of the stationary shank **24** over which it is fitted thus permitting the sleeve to freely slide therealong. Resilient leaf spring like fingers or jaws **51** are formed or otherwise attached to the lower end of the bifurcated sleeve **49** so that they extend axially forward therefrom. Since the tips or ends **50** of the fingers **51** are to lightly engage against and slide longitudinally along the outer surface of the terminal **30**, the center or middle portion **52** of the fingers are curved radially inward so that the fingers converge together at their free end. For purposes of clarity only two fingers have been illustrated although it is to be realized that any suitable number of fingers can be used for forming a conical shaped housing around the free end of the tool.

In order to both hold the head **40** in a proper operation position on the guide **24** and to permit the head to move axially along the guide, a biasing element, which is shown as a spring **42**, is connected between the clamping attachment **38** and the head. Preferably the spring **42** is of the helical coiled type and is attached at either end, as by welding or brazing at **54** and **56**, to the clamping attachment **38** and head **40**, respectively. Each coil of the spring **42** should be spaced well apart from one another to permit compression of the spring as the head **40** slides longitudinally along the guide **24** toward the clamping attachment **38** under any longitudinal pressure in excess of the predetermined value exerted by the spring in the forward direction.

The general operation of the spreading adapter can be described in substantially the following manner: The complete spreading adapter **36** is first slipped over and slid along the guide **24** of the connecting tool **10** with the clamping attachment **38** orientated next to the tool until the adapter is properly positioned thereon as shown in FIGURE 1. The clamping attachment **38** will now hold the spreading adapter **36** in operating position. The end of the filamentary element to be wrapped around the binding post, such as the wire **32** shown in FIGURES 2 and 3 is inserted into the groove **34** on the bit **22** in the manner normally followed when such a connecting tool is being used. With the adapter thus secured on the guide **24** of the connecting tool **10**, and the end of the wire **32** located in the groove **34**, the tool is ready for use.

The tip or ends **50** of the spreading adapter **36** is now ready to be placed around the free end of the binding post **30** in the manner illustrated in FIGURE 2. The connecting tool **10** is then pressed forward thereby causing the tips **50** to slide along the outer surface of the terminal

30 and the end of the terminal to enter the recess 28 of the bit 22. As the tips 50 slide along the terminal 30 the various loose elements 58 (see FIGURE 5) will be pushed or forced away from the terminal and will ride or slide upon the outer surface of the fingers 48 thereby leaving the top portion of the terminal 30 exposed for wrapping.

However, in those instances where the first connection or wrapping of the wire 32 is to be made about the lower end of the terminal 30, the connecting tool 10 is pushed as far forward as possible before performing the wrapping operation. As illustrated in FIGURE 3, this movement of the tool results in the tips or apex 50 of the spreading adapter 36 being pressed into engagement against the base 60 or work surface of the terminal 30. With the spreading adapter held against any further movement in a forward direction, the guide 24 of the connecting tool 10 will slide along the inside of both the bifurcated head 40 and resilient fingers 51 thereby spreading the fingers apart. This spreading of the fingers serves to move or spread the loose elements 58 away from the base of the terminal 30 thus permitting the lower end of the guide 24 to engage the base 60. Without the presence of this spreading action it would be impossible to force the blunt lower end of the guide 24 against the base 60 of the terminal 30 since the loose elements 58 would be located between the end and the base thereby holding them apart. With the bit 22 now positioned at the lower portion of the terminal near the base, the connecting tool is energized thereby coiling the wire 32 about the terminal.

Once the wire 32 is properly wrapped about the terminal 30 the connecting tool is deenergized and withdrawn from about the terminal. As the guide 24 is pulled up along the terminal, the compressed spring 42 will be released and the fingers 48 effectively pushed forward thus permitting the tips 50 of the spreading adapter 36 to again engage against the surface of the terminal in a manner similar to that shown in FIGURE 2. This releases the loose elements 58 and permits the spreading adapter and tool to be completely withdrawn from the terminal without damaging the elements or the connection just formed.

For permitting the spreading adapter 36 to be locked in an inoperative position on the connecting tool whenever its use is not necessary or desirable, the locking element 44 is attached to and carried by the adapter 36. This locking element 44 consists of a catch flange 62 formed on the upper end of the sleeve 49 and a spring clip catch 64 carried on the clamping attachment 38. Preferably the catch flange 62 takes the form of a ring into which a plurality of notches or channels 66 (see FIGURE 5) have been cut. The spring clip catch 64 includes at least one, and preferably two or more cantilevered springs 68 on the free end of which is formed a catch surface 70.

To lock the adapter element in the inoperative position shown in FIGURE 4 it is only necessary to force the head 40 back against the spring 42 until the catch surface 70 engages over the flange 62 thus locking the head against forward movement. To release the head 40, the head is rotated against the pressure of the spring 42 until the notches 66 in the flange 62 are aligned with the catch surface 70. With the catch surface no longer engaged over the flange the head 40 is now free to slide forward into its normal operating position under the pressure exerted by the coiled spring.

From the foregoing it is readily apparent that a new and novel spreading adapter has been described which renders obsolete the use of a probe or other like tool for spreading loose elements away from a surface upon which work is to be performed. Not only is the spreading adapter compatible with existing connecting tools, but the use thereof is equally adaptable to other tools and such use insures a faster assembly with a resulting decrease in cost.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. An apparatus for spreading elements away from a tool head secured to the free end of a shank comprising:
   (a) sleeve means slidably mounted on said shank and bifurcated at the end adjacent to said tool head,
      the fingers formed by said bifurcated sleeve means extending over and converging forward of said tool head thereby forming at least a partial enclosure around said tool head for preventing said elements from contacting said tool head as said tool head is moved through said elements; and
   (b) bias means connected to said sleeve means for biasing said sleeve means in a forward direction toward said tool head,
      said tool head being removed from within said partial enclosure for performing work by sliding said sleeve means along said shank against said bias thus bringing said tool head into engagement against the inner surface of said housing thereby causing said fingers to be spread apart by said tool head and any elements engaged by said fingers to be spread away from said exposed tool head.

2. An apparatus according to claim 1 wherein clamp means is operatively connected to said shank and said bias means for preventing said sleeve means from sliding off of said shank.

3. An apparatus according to claim 2 wherein said bias means is a spring attached between said clamp means and said sleeve means.

4. An apparatus according to claim 3 wherein said spring is of the coiled type.

5. An apparatus for spreading elements away from a tool head secured to the free end of a shank comprising:
   (a) a hollow cylindrical sleeve means rotatably and slidably mounted upon said shank,
      said sleeve means being bifurcated at the end adjacent to said tool head with the fingers thereof extending over and converging forward of said tool head thereby forming a partial enclosure having a substantially conical shape around said tool head for preventing said elements from contacting said tool head as said shank is moved through said elements;
   (b) attaching means secured to said shank,
      said attaching means consisting of a hollow sleeve mounted upon said shank,
      said hollow sleeve including resilient means for removably gripping said shank; and
   (c) spring coil biasing means positioned around said shank and secured at one end to said attaching means and at the other end to said sleeve means for biasing said sleeve means toward said tool head means and for cooperating with said attaching means for preventing said sleeve means from sliding off of said shank,
      said tool head being removed from said enclosure for performing work by sliding said sleeve means against the bias of said spring thereby causing said fingers to be spread apart by said tool head bearing against the inside surfaces thereof and any elements engaged by said fingers to be spread away from said tool head.

6. An apparatus according to claim 5 wherein means is provided for selectively locking said sleeve means on said shank so that said tool head remains in an exposed condition.

7. An apparatus according to claim 6 wherein said locking means includes a cantilever catch secured to said

attaching means for engaging and holding a flanged surface formed on said sleeve means.

8. An apparatus according to claim 7 wherein notch means are formed in said flanged surface for releasing said cantilever catch when said locked sleeve means is rotated about said shank thereby releasing said sleeve means for movement forward by said biasing means.

9. In combination with a wire wrapping tool including a hollow stationary shank inside of which is located a rotatable bit having formed on the free end thereof a tool head for wrapping a filamentary element about a binding post, an apparatus for spreading elements away from said binding post so that said bit can be properly positioned around said binding post comprising:

(a) a hollow cylindrical sleeve means rotatably and slidably mounted upon said shank,

said sleeve means being bifurcated at the end adjacent to said tool head with the fingers thereof extending over and converging forward of said tool head thereby forming a partial enclosure having a substantially conical shape around said tool head for preventing said elements from contacting said tool head as said shank is moved through said elements;

(b) attaching means secured to said shank,

said attaching means consisting of a hollow sleeve mounted upon said shank,

said hollow sleeve including resilient means for removably gripping said shank; and

(c) spring coil biasing means positioned around said shank and secured at one end to said attaching means and at the other end to said sleeve means for biasing said sleeve means toward said tool head means and for cooperating with said attaching means for preventing said sleeve means from sliding off of said shank,

said enclosure being removed from around said tool head thus exposing said tool head for wrapping said filamentary element about said binding post by sliding said sleeve means against the bias of said spring thereby causing said fingers to be spread apart by said sleeve means bearing against the inside surfaces thereof and any elements engaged by said fingers to be spread away from said tool head.

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